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Phytoremediation of industrial effluent and Reduction of physico-chemical parameters from pond water using aquatic weeds

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Abstract: *Aquatic bodies are the traditional recipients of industrial wastes containing heavy metals, which are released in higher concentrations and cause deleterious effects on organisms. The disposal of sewage into adjacent natural streams leads to depletion of DO and increase in BOD of the water. Aquatic plants were found to be very useful in the reduction of pollutants in the water bodies. Aquatic plants play an important role in stabilizing and maintaining clear water state and maintaining the water quality in aquatic system. Aquatic plants play an important role in treatment of waste water and industrial effluents. Maximum reduction of EC, Total dissolved solids, BOD, COD, Sulphate and Phosphate was observed in industrial effluents by using E.Crassipes than P.stratiotes.*

Key Words: *E.Crassipes, P.stratiotes, effluents, physical parameters, chemical parameters.*

I. Introduction

The effluents of most of the industries are simply drained out into the water bodies or drainage nearby without any proper treatment. These waste water are spoiling the entire environmental condition of the town (Ramasubramanian et al., 1993). The industrial wastes may have pollutants of almost all kinds from simple nutrient and organic matter to complex toxic substaces. Biological method of treatments especially using macrophytic plants is simple, safer and cost effective. It can be used at any reason. It is an economically viable technology. The aquatic weeds used for BOD removal seems to function has fixed film reactors with the submerged plant structures act as a substrate for bacteria. Some aquatic plants can transport atmospheric oxygen from the foliage into the root.

II. Materials and Methods

Aquatic weeds selected for the study were Eichornia and Pistia. Plants of equal size from each group were used for the experiment. Pond water sample was taken in 7 plastic troughs (7 litre capacity). Weighed quantity of two types of aquatic plants were introduced separately to each tub containing pond water. One tub containing the same pond water without the plants served as control. All the troughs were kept exposed to sunlight for 48, 72 and 96 hrs and the plants were removed after these periods of treatment and the parameters were analysed in the control and the plant treated waters by standard method of APHA, (2005).

III. Results and Discussion

The aquatic weeds, Eichornia crassipes and pistia stratiotes are found to be the economically viable choices for pond water treatment for the removed of EC, BOD, Sulphate and Phosphatesuvarna and charya, (1995) have observed a gradual change in the pH from neutral to alkalinity with the increase in the incubation time in pistia grown medium which may attributed to the release of free ions from the plant to the medium similar increase in pH has been recorded during treatment with E.crassipes and P.stratiots.

Maximum reduction in EC was achieved by E.crassipes and P.stratiots treatment similarly Mishra et al. (1991) have obtained a reduction in EC in the treatment of waste water using water hyacinth.

Murugesan et al. (1996c) have achieved 89 percent of total dissolved solids reduction by P.stratiotes, 77 percent by Trapha, 82 percent by Salvinia molesta. Similar results were observed in the present study where in 75 percent, 75 percent and 87.50 percent of total dissolved solids was removed from pond water treated with E.Crassipes 62.50 percent, 62.50 percent and 87.50 percent by P.Stratiotes during 48, 72 and 96 hours treatment. Removal of solids by plants is probably due to the root systems which favour sedimentation of solid particles both on the bottom of the container as well as by trapping in the root hairs.

BOD removal was found to be effective by plants as in the present study, 83, 78 percent removal was achived in 96 hours treats with P.Stratiotes. Similarly 85.57.Zhenbin et al.(1993) have achieved 85.57 percent of BOD reduction in pond water treated with E.Spirodela, pistia and alterranthera. Oxygen not required for root respiration may diffuse into the waste water and be utilized by bacteria for the oxidation of BOD. This statement

agrees with present finding with regard to the efficiency of P.Stratiotes which effects 75.68 percent, 81.08 percent and 83.78 percent removal of BOD during 48, 72 and 96 hoyrs treatment.

Sulphates and phosphates have been effectively removed by plants during treatment for 48, 72 and 96 hours and it was found 87.5 per cent and * percent removal of sulphate through the treatment with E.Crassipes and P.Stratiotes and 60.61 percent removal of phosphate was achieved through P.stratioles treatment in 96 hours.

Zhenbin et al. (1993) have observed a minimum 15.8 percent reduction of the total phosphate from waste water treated with Eicchornia, Spirodela, Pistia and Alternanthera. Pescod, (1994) has indicated that E.Crassipes, is very effective in removing phosphorous upto 96 percent.

IV. Tables

Table 1: Reduction of pollution load in industrial effluent by using aquatic plants

Parameters	Raw effluent	E. Crassipes			P.Stratiotes		
		48 hrs	72 hrs	96 hrs	48 hrs	72 hrs	96 hrs
P^H	7.74	8.35	8.21	8.16	8.34	8.23	8.05
EC	3.39	2.50	2.30	2.20	2.80	2.70	2.50
TSS	8000.00	4000	4000	2000	2666.67	2000	2000
TDS	5333.33	2000	2000	666.67	1333.33	1333.33	666.67
BOD	123.33	38.33	36.677	35.00	30	23.33	20
COD	277.33	173.33	165.33	157.33	157.33	149.33	146.67
Sulphate	40.00	8.33	6.67	5.00	10.00	6.67	5.00
Phosphate	9.47	5.23	5.17	5.03	4.07	3.93	3.73

All values are in mg/l – 1 except pH and EC in mmhos / cm

V. Conclusion

Biological method of treatment, especially using macrophytic plants is simple, safer and cost effective. It can be used at any time at any season its an economically viable technology. The aquatic plants are effective in controlling the growth of algae in lagoons and purification of waste water by their cellular enzyme system accomplishing oxidation without oxygen by removal of hydrogen.

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